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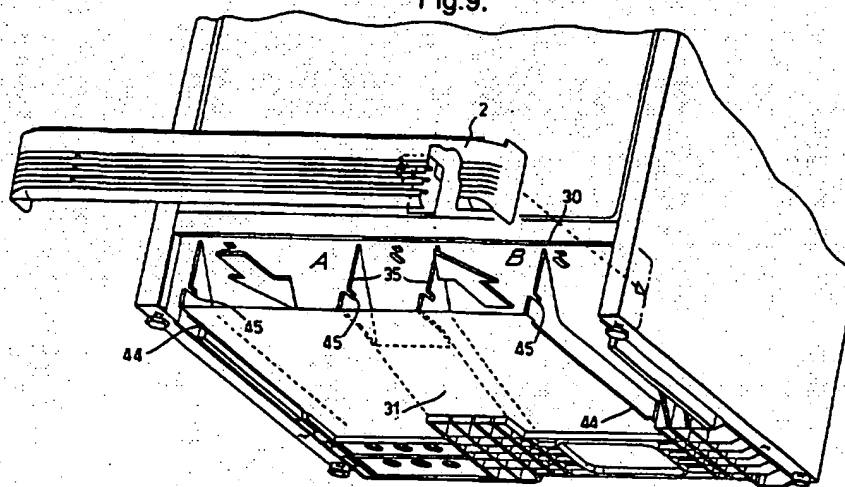
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(54) Abstract Title

Refrigerating appliance

(57) A refrigerating appliance which is built-in or which can fit under a worktop comprises a base which accommodates a condenser, a fan and a compressor. The openings for access to the passages are separated by a separation zone (35) to minimise remixing of the respective air flows. The base may have a plurality of engagement elements for holding the compressor, the fan and the condenser in place.

Fig.9.



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Fig.1A.

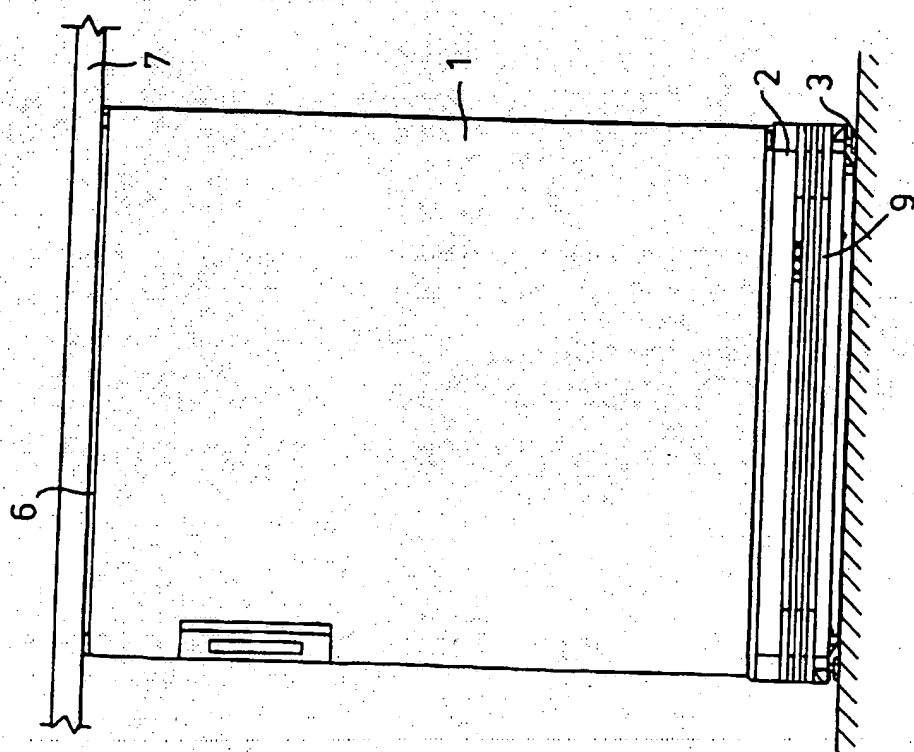
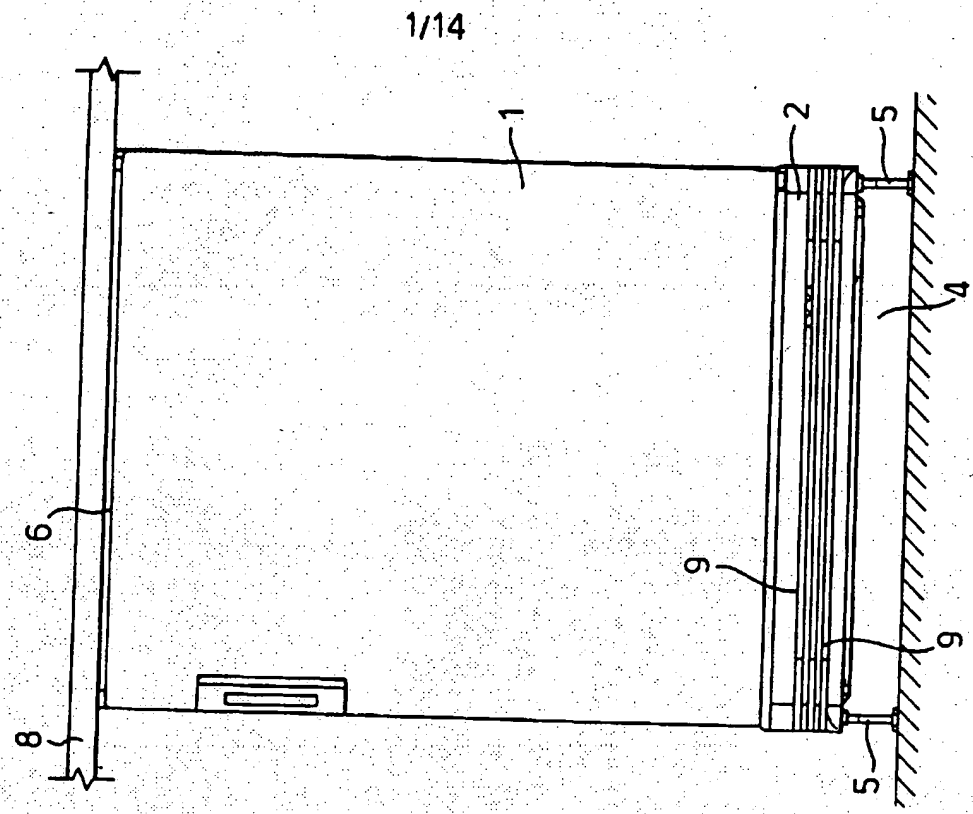


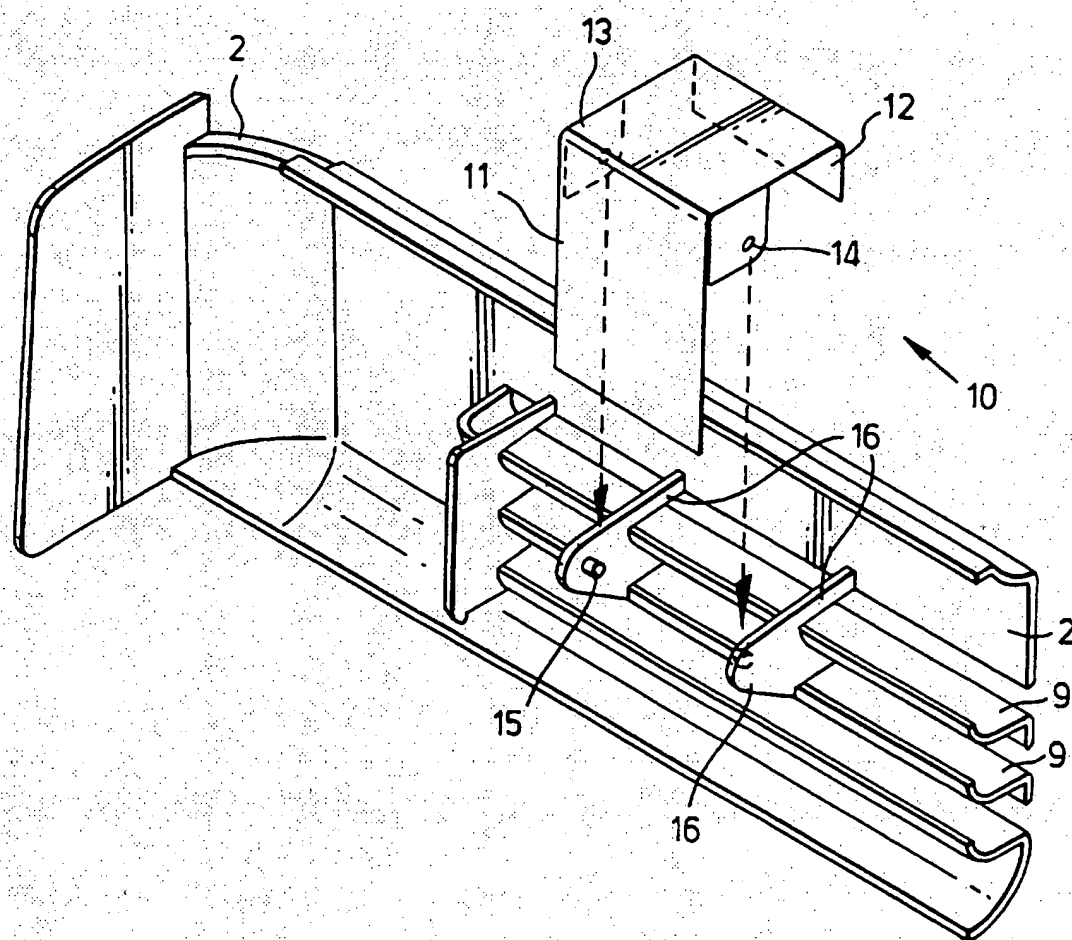
Fig.1B.



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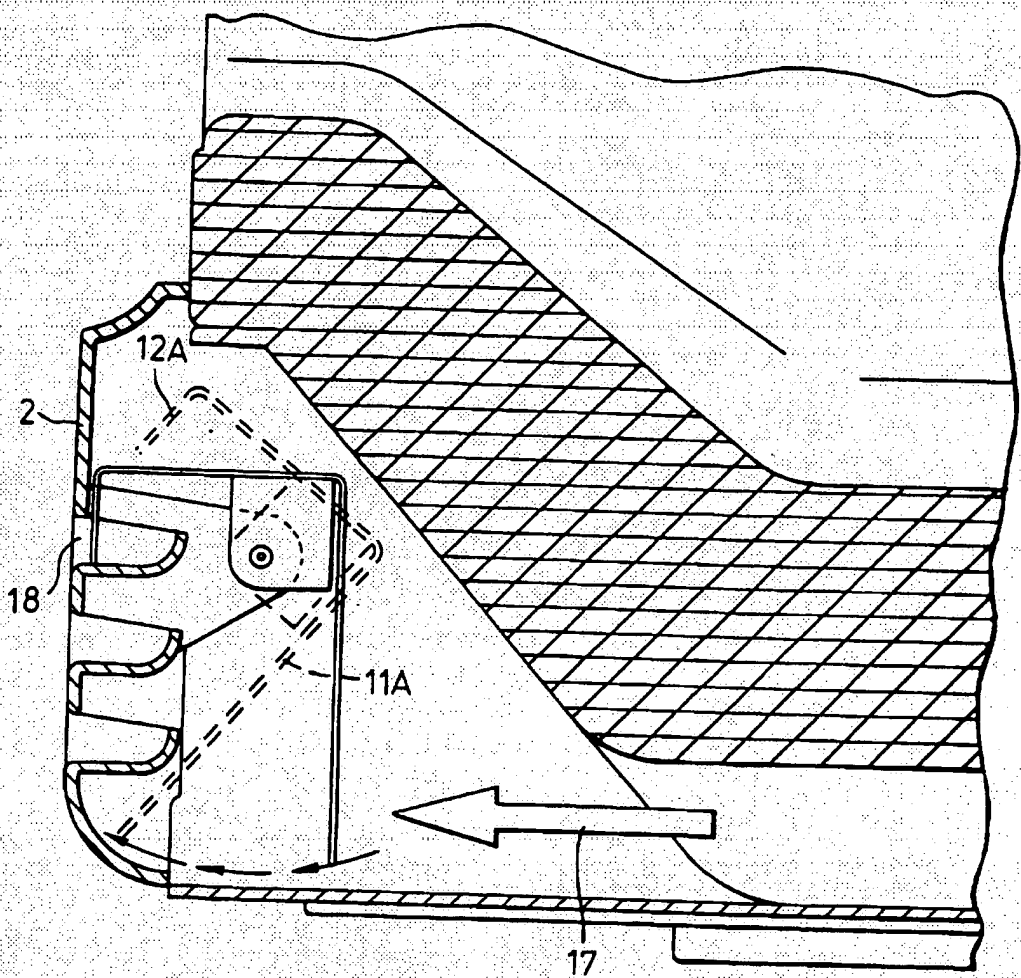
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Fig.2.



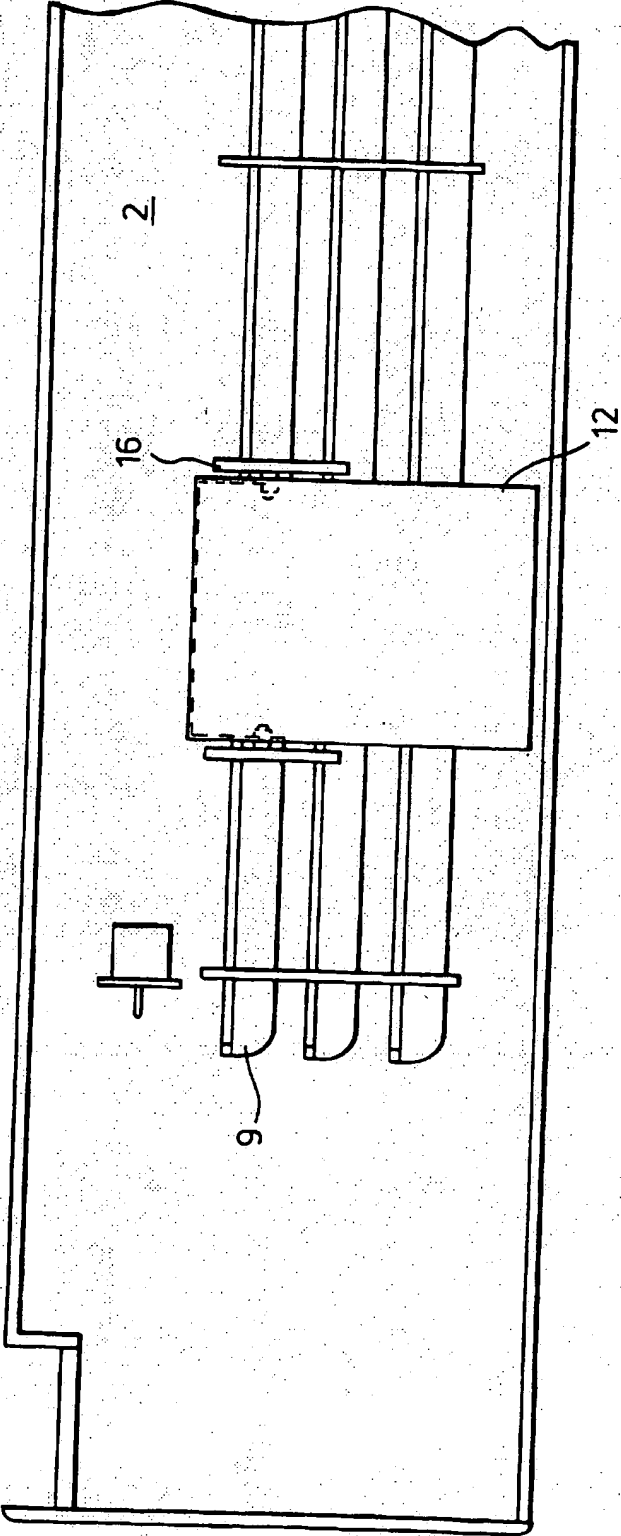
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Fig.3.



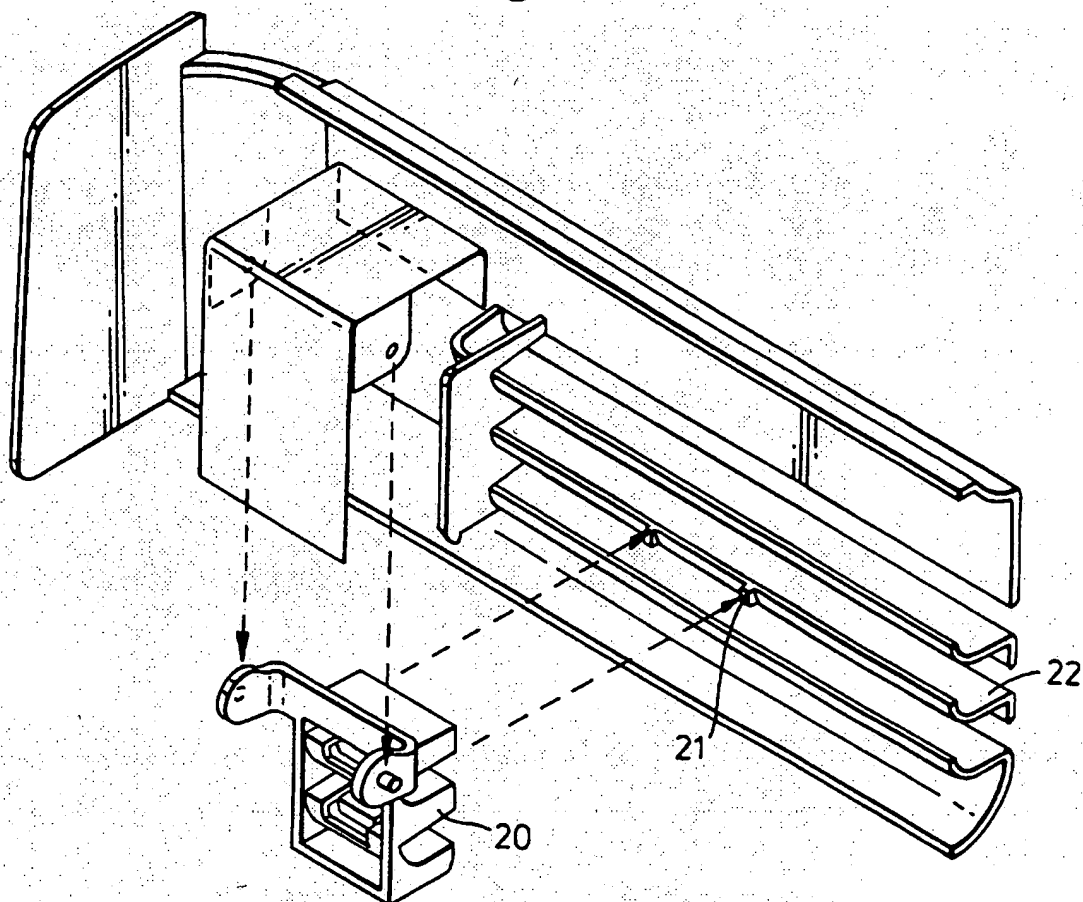
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Fig.4.



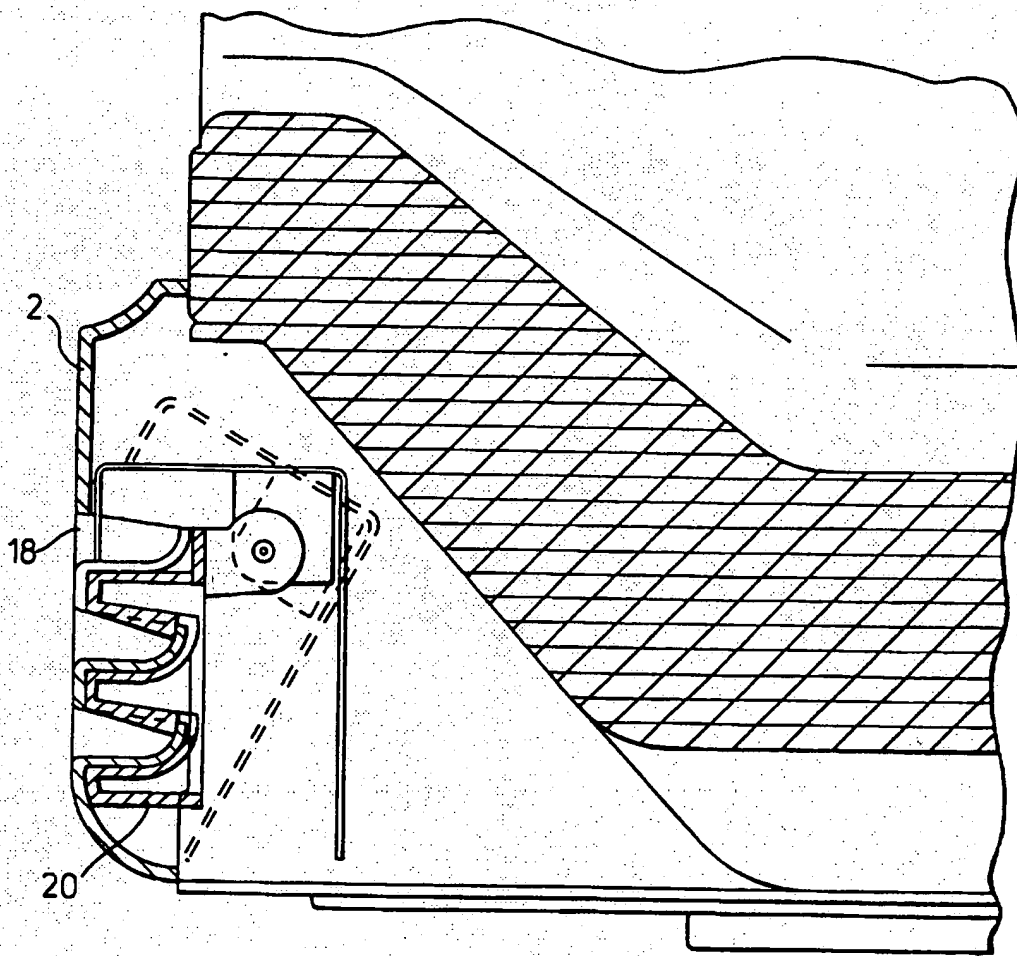
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Fig.5.



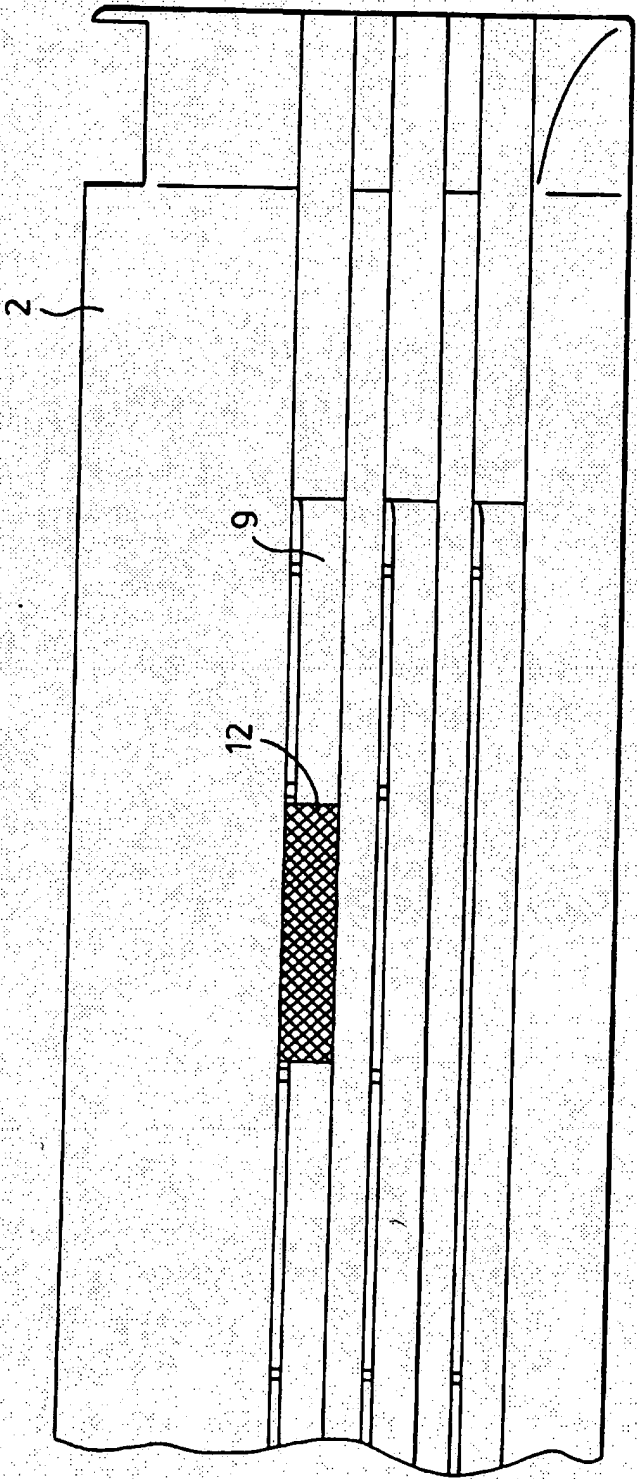
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Fig.6.



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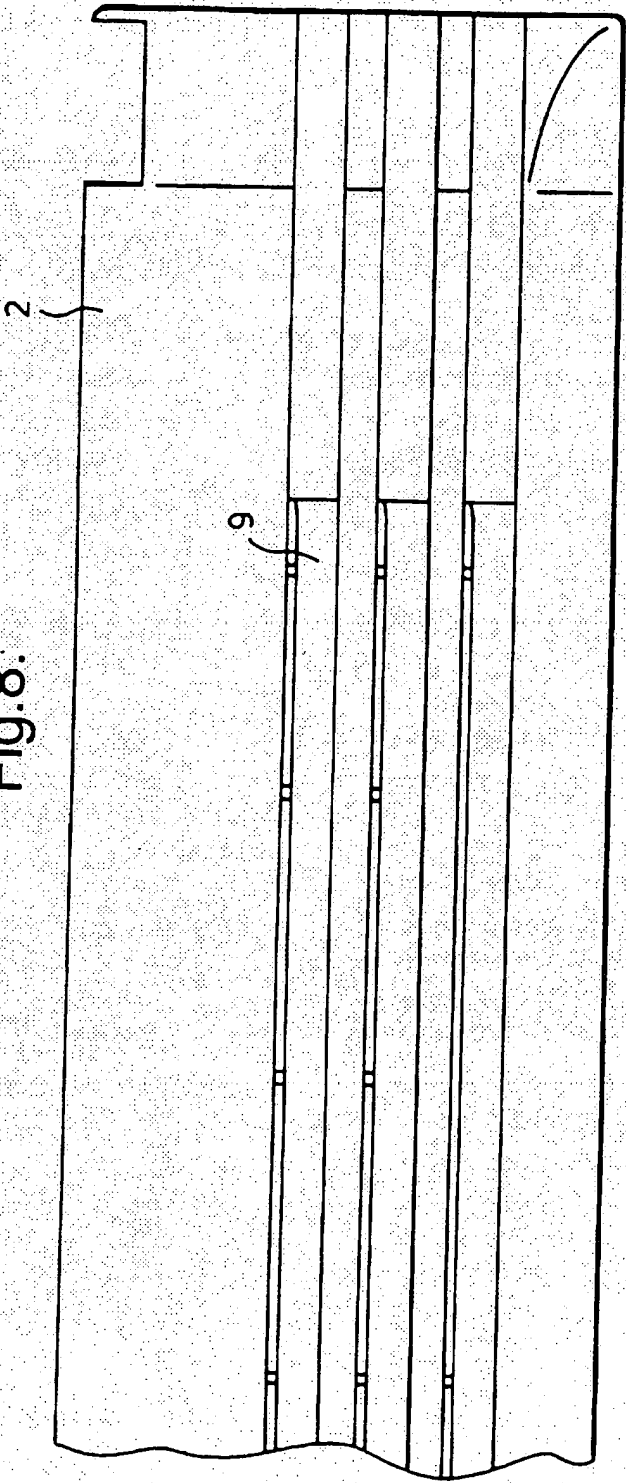
Fig.7.





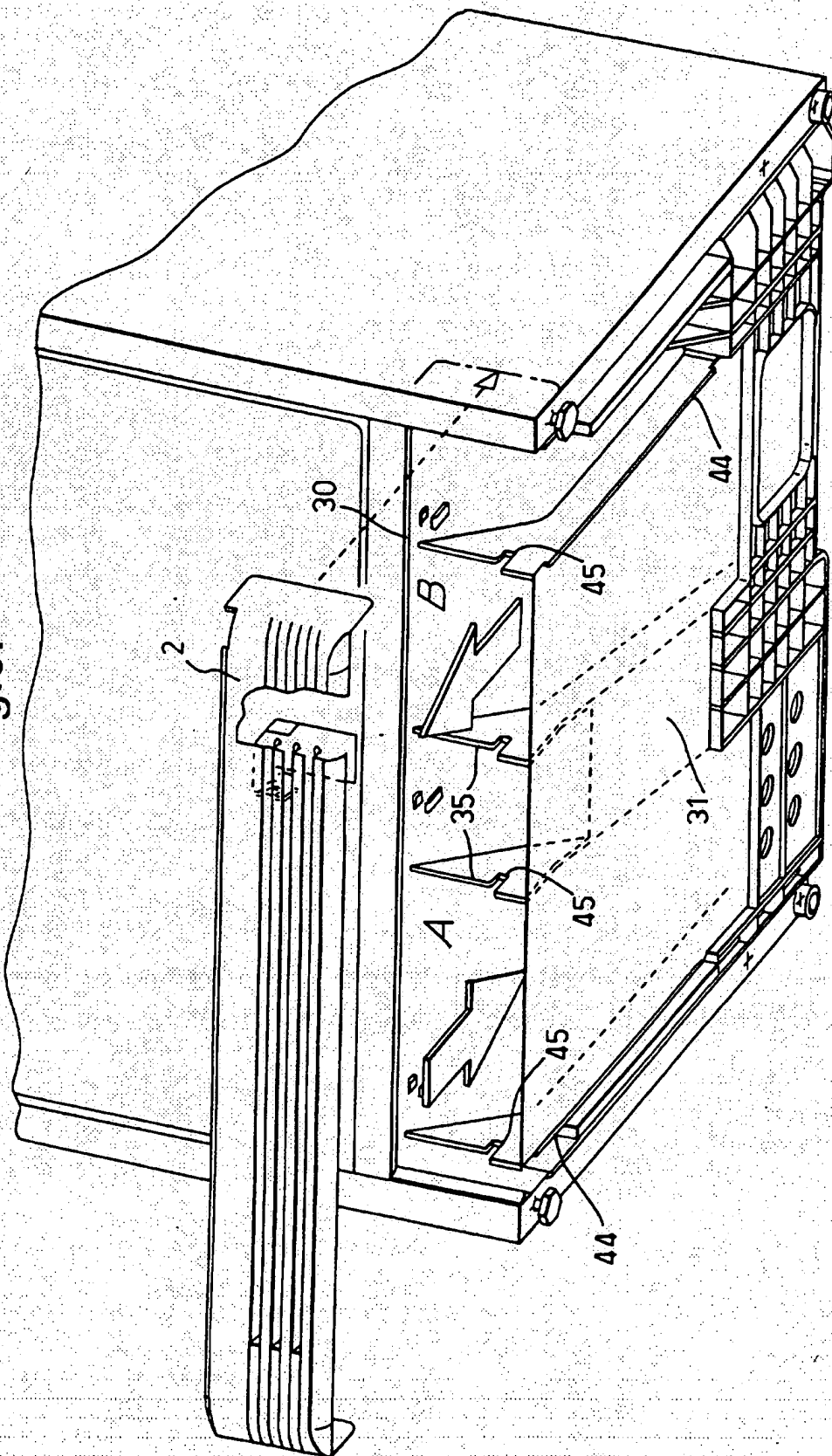
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Fig.8:



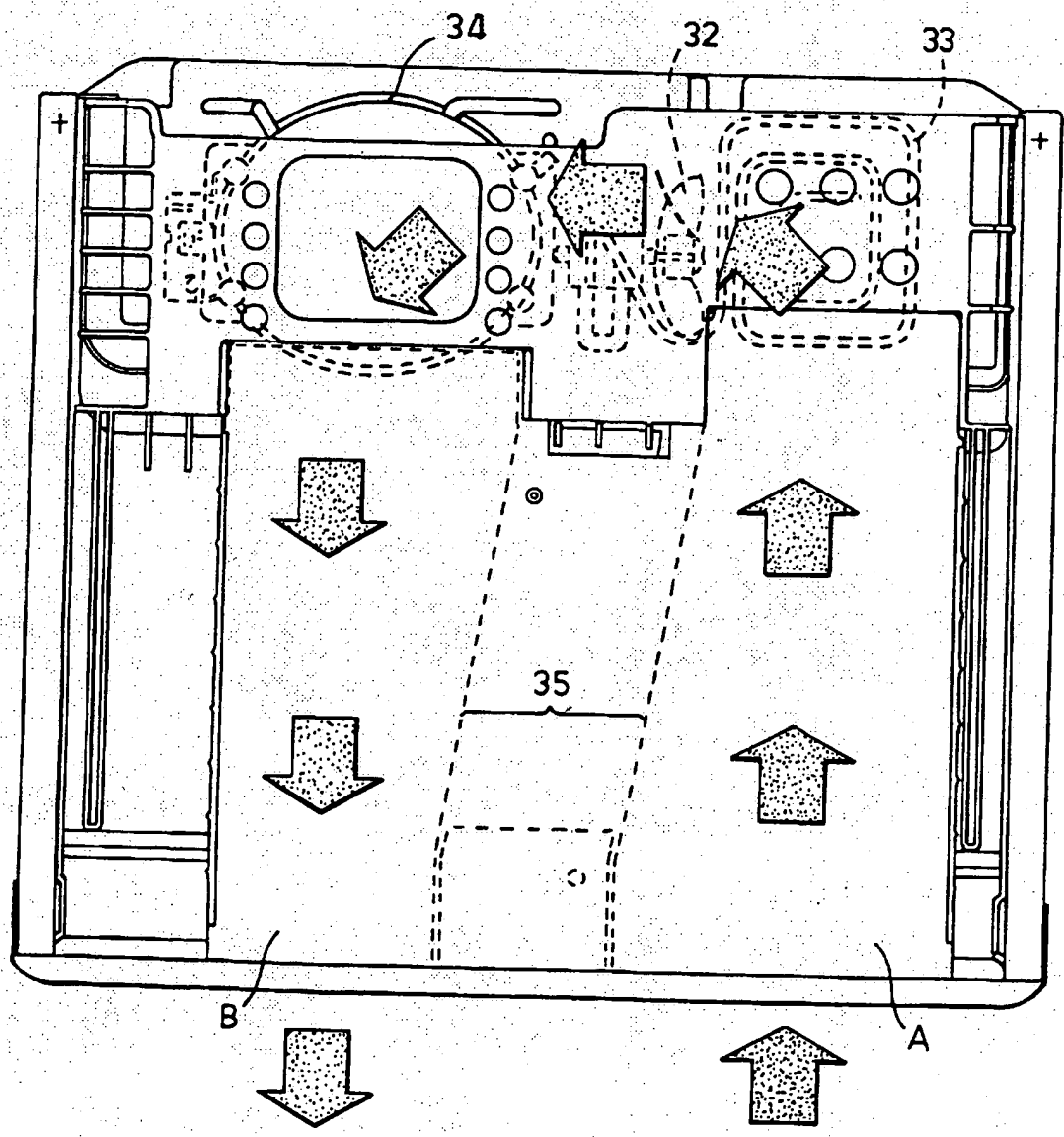
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Fig.9.



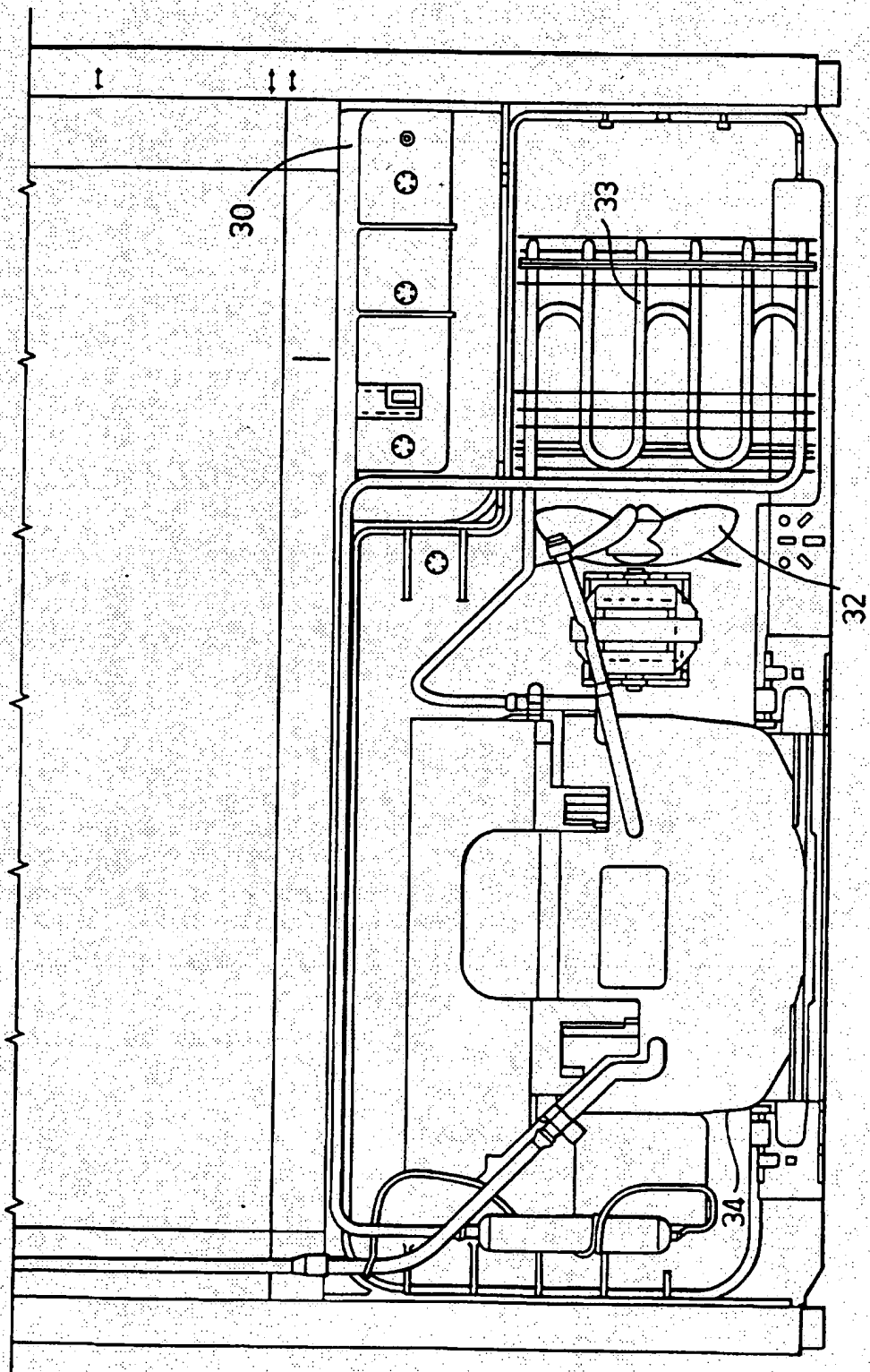
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Fig.10.

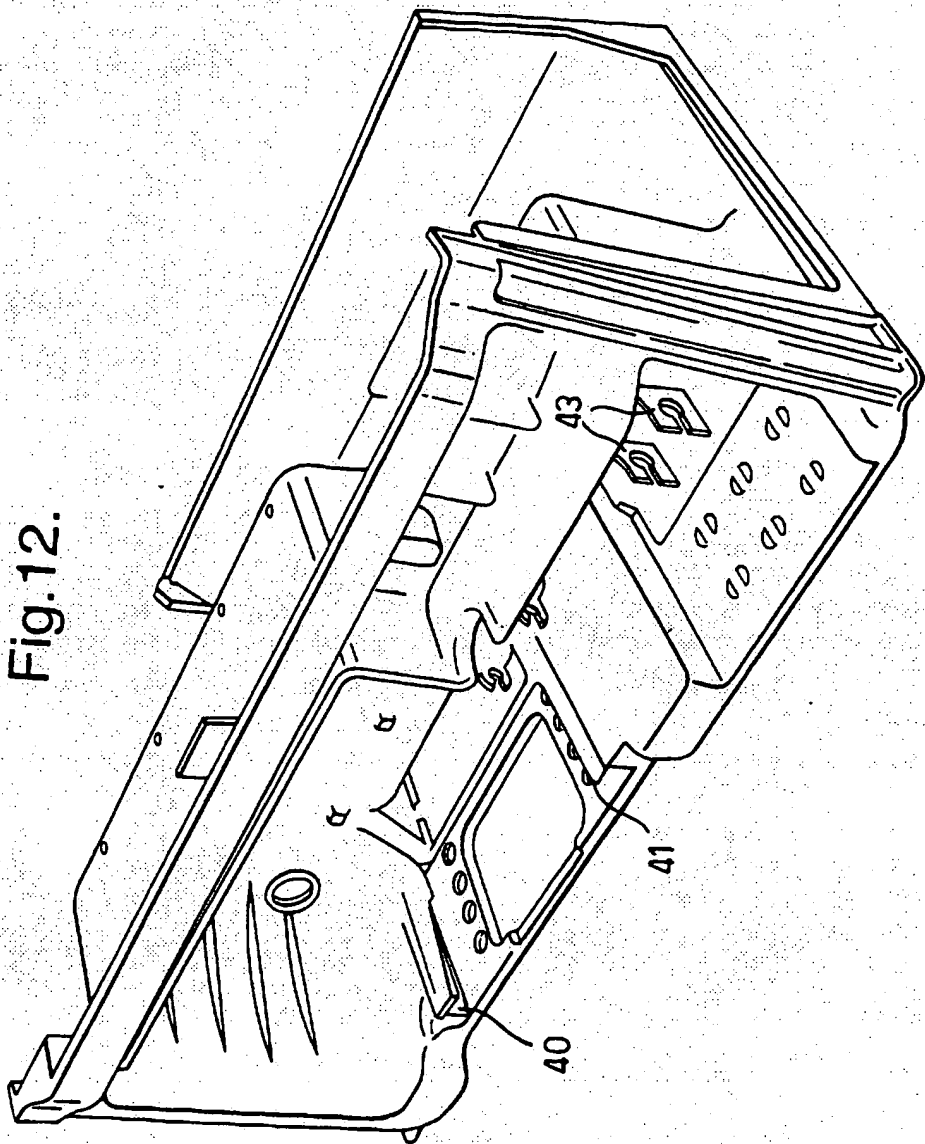


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Fig.11.

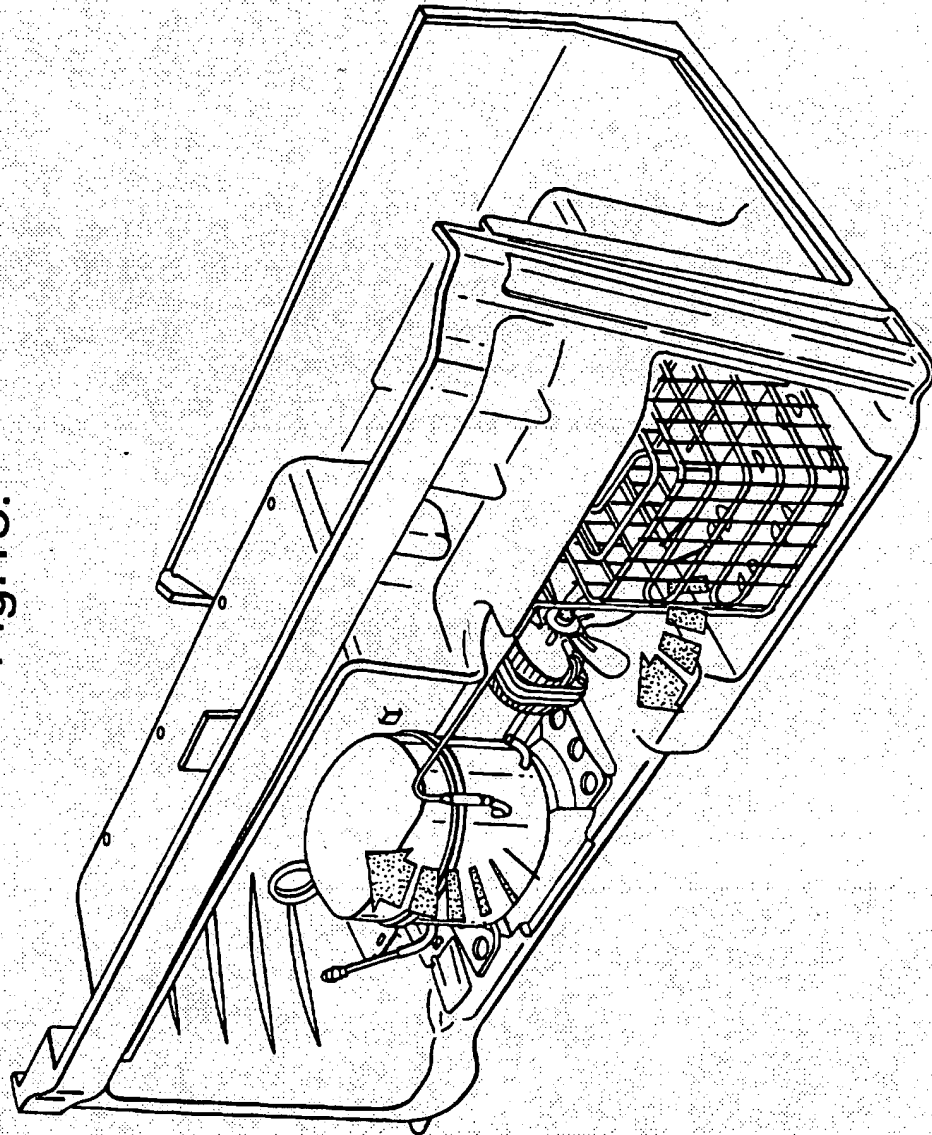


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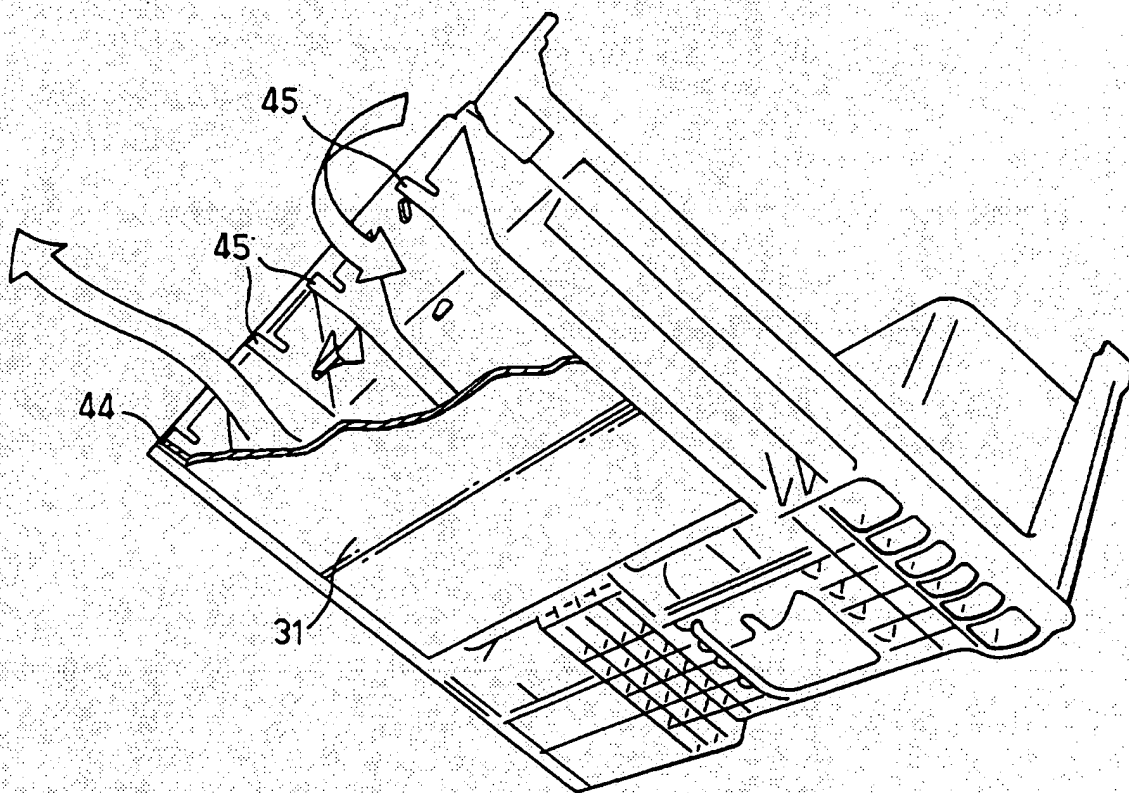
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Fig.13.



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Fig.14.



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**REFRIGERATING APPLIANCE PROVIDED WITH AN IMPROVED BASE**

The invention relates to a refrigerating appliance, in particular a domestic refrigerating appliance, which can be placed beside or inserted between the units of a unit-style kitchen, and provided with an improved base containing the compressor, the condenser and an associated cooling fan.

The refrigerating appliances of that kind can be accommodated in various positions in all of the units of the kitchen but they are normally disposed beneath a work top which is common to various units and they rest directly or indirectly on the floor.

Whatever may be their position of insertion, they suffer from the problem of permitting an adequate circulation of air for cooling the condenser and the compressor of the refrigerating unit; in actual fact, for such types of refrigerating appliances, the condenser and the compressor are accommodated in suitable recesses provided in a specific base provided as a lower support for the refrigerator but which also performs the function of accommodating the above-mentioned functional components.

Consequently refrigerating appliances have been designed in which the compressor and the condenser are inserted in the base, below the refrigerating compartment, and they are cooled by a forced circulation, by means of a fan, of air which is drawn in and expelled through primarily front openings in the base of the casing.

A refrigerator is in fact known for example from the present applicants' Italian patent No. 203038, which is provided with a base comprising a front base for the forced circulation of air, a fan and a condenser, preferably designed with a tube which is coiled up for reasons of space, in which said base has a path for the circulation of air which is of a variable and highly irregular section.

That construction suffers from two types of problems: first of all construction and assembly of suitable base gives rise to a substantial increase in costs, which is particularly burdensome in regard to this type of product which is known to have to be extremely competitive; secondly the irregularity of the flow path for the forced circulation of air involves poor optimisation of the compressor cooling effect, with a consequential substantial increase in the levels of power consumption, something which is to be particularly borne in mind when the refrigerator is disposed at such a



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height, to satisfy different standards in regard to the kitchen units (see the accompanying figures) that the base has to be raised above the floor, leaving a space there beneath which naturally acts as a by-pass passage for the circulation of air, modifying and frequently worsening the conditions of operation of the fan and thus the cooling  
5 conditions.

In addition the further disadvantage is often encountered, that the path of the forced air progressively becomes clogged with fluff, dirt and other light residues which are present on the floor and which are easily drawn in by the intake opening of the fan which is disposed precisely at the level of the floor; such blockages are not noticed  
10 by the user who does not have easy and immediate ways of checking the operability of the duct-fan system, so that, if the cooling effect turns out to be inadequate, the refrigerator is forced to operate under ever increasingly difficult and thus burdensome conditions until in the worst scenario the situation involves compromising of its operability perhaps even by virtue of fracture of some operational component.

15 Refrigerators of the described type are also known in which the base is substantially designed in an even more elementary manner, being completely devoid of the lower surface and in which the components are supported on transverse members disposed at the bottom and connected to the lower sides of the base itself.

Besides a worsening of the cooling conditions due to the variability in the  
20 path of flow of the forced air, those refrigerators also involve a worsening in terms of the costs involved in construction and assembly of the transverse members.

It would thus be desirable, and this is the aim of the present invention, to improve the construction of such refrigerators by providing them with bases which at the same time reduce the production costs thereof and improve the levels of consumption  
25 thereof by means of precisely and stably determining the flow of cooling air and thus an increase in the output of the compressor which accordingly operates under more favourable conditions.

The invention also provides a refrigerating appliance, of the type to be built in or fitted under a worktop, comprising at least one space for preserving foods, a  
30 subjacent base in which are accommodated a condenser, a fan and a compressor, said base being provided with a plurality of front grills with respective openings for the intake and discharge of the air for cooling said components of the refrigerating unit, said base

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comprising two distinct and separate passages on the intake of the cooling air from the exterior and for the discharge of the cooling air to the exterior, the section of said passages being completely independent of the position (height) at which said refrigerator is accommodated, wherein the openings for access to said two passages are spaced by a separation zone.

Attention is directed to our co-pending application no. 9702344.4, publication no 2310034, from which the present application was divided and which describes and claims a refrigerating appliance, of the type to be built in or fitted under a worktop, comprising at least one space for preserving foods, a subjacent base in which are accommodated a condenser, a fan and a compressor, said base being provided with a plurality of front grills with respective openings for the intake and discharge of the air for cooling said components of the refrigerating unit, wherein there is provided a movable signalling device comprising means for intercepting the air flowing through said openings, and external display means capable of protruding therefrom in such a way as to be visible from a position in front of said appliance.

The invention and the numerous modifications thereof will be better appreciated from the following description given solely by way of non-limiting example and with reference to the accompanying drawings in which:

Figures 1A and 1B diagrammatically show a front view of an under-worktop refrigerator disposed at two different heights from the floor;

Figure 2 shows a cut-away view of an internal portion of a refrigerator base according to the invention;

Figure 3 shows in diagrammatic form a vertical cross-section of the base in Figure 2;

Figure 4 is a rear orthogonal view of the base portion shown in Figure 2;

Figure 5 is a cut-away view of an alternative form of a refrigerator base according to the invention;

Figure 6 is a diagrammatic vertical cross-section of the base shown in Figure 5;

Figures 7 and 8 show a front view of a base according to the invention, respectively without and with the signalling device exposed;

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Figure 9 shows a cut-away view of an improvement of a base of a refrigerator according to the invention;

Figure 10 shows a horizontal section of the refrigerator base of Figure 9;

Figure 11 is a view from the back of the base shown in Figure 9;

5 Figure 12 is a three-quarter rear perspective view of the same base without components;

Figure 13 shows the previous view but with the components mounted in the base and

10 Figure 14 is a perspective view from below of the same base with a cut-away view of the lower casing.

The invention arises out of the circumstance that a domestic refrigerator, in particular a refrigerator which can fit under a worktop or table, can be disposed at various heights from the floor, as shown in Figures 1A and 1B from which it can be seen that the refrigerator 1 which is provided with a base 2 and support legs 3 can be  
15 positioned beneath tables or worktops of different heights, for example at 820mm and 870mm from the floor; that fact means that, if there is a wish to accommodate the same refrigerator beneath both types of table or worktop, it will be necessary to provide the refrigerator with legs 3,5 of different heights so that the top surface 6 of the refrigerator is in any case a close fit to the underneath surface of the worktop 7,8 respectively. By  
20 virtue of the refrigerator being raised to a certain distance from the floor, between the floor and the refrigerator there is then an empty space 4 into which air is drawn by the fan which is disposed behind the base 2; as stated this fact gives rise to the disadvantage that cooling of the compressor and the condenser are modified thereby and are normally made worse since normally both intake and discharge of the air take place by way of  
25 openings provided between the grills 9 of the base and in addition it is not possible to check whether the flow of air is in fact present, something which can be compromised both by non-operation of the fan and by a blockage at some point in the path of the flow of air.

In order to be able to check at any time the effective existence of a flow of  
30 cooling air of adequate capacity, disposed in the interior of the base is a movable signalling device 10 (see Figures 2 to 6) substantially comprising a first part 11 for intercepting the flow of air and a second external signalling part 12 which is angled with

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respect to the first part. The device is disposed in front of the outlet mouth opening for the discharge air disposed behind the base, which is not shown, but the configuration presented by the drawings and the description will not involve any uncertainty on the part of the man skilled in the art.

5           The device 10 is provided with two lateral limbs 13 in which there are provided respective holes 14 for engaging on to suitable respective pivots 5 projecting from respective ribs 16 integrally provided with the grills 9 of the base 2. When that device is mounted internally of the base, as is shown in particular in Figures 3 and 4, and the refrigerator is in the rest condition, there is no flow of air and the device is disposed  
10 under the force of gravity as shown in heavy line in Figure 3; in that position the second part 12 is of such a configuration and dimension as to be disposed in front of and also partially outside the opening 18 between two adjacent grills, so as to be clearly visible to an outside observer (Figure 7). When the refrigerator is operating normally and the fan is thus actuated the flow of discharge air shown by the heavy black arrow 17,  
15 intercepting the first part 11a, urges it outwardly, thus rotating the entire device 10 and in particular lifting the second part 12a and moving it away from the opening 18, as shown by the dotted line configuration of the device in Figure 3.

In that way it is possible to check immediately and easily that, with the refrigerator operating, there is a flow of air that is sufficient to cool the internal  
20 components; indeed it is possible and easy to calibrate the geometry and the weight of the various components described in such a way that the second signalling part 12, 12a disappears from the view of the external observer (see Figure 8) only when the flow of discharge air is of the precise capacity for correct cooling of the components.

Figures 5 and 6 show a preferred structural alternative of the invention;  
25 indeed, producing the ribs 16 by moulding is rather expensive and complicated and it is thus advantageous, as shown in Figures 5 and 6, to use a suitable support 20 which can be inserted by latching engagement into suitable latching notches 21 projecting from the rear part of one, or more grills 22, and capable of supporting the device 10 and causing it to operate substantially as described; Figure 6 is a view corresponding to the view  
30 shown in Figure 3 but with the support shown in Figure 5.

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It will be appreciated that the proposed embodiments are given solely by way of example, and the invention can be used in many other configurations and in particular also with the device 10 disposed in front of the intake mouth opening.

The constructions described are effective for monitoring the operability of the fan and the absence of serious obstacles to the flow of cooling air when the refrigerator is in operation, but often it is not possible or easy or reliable to check that the compressor is not operating before checking that there is not an adequate flow of air. It can in fact happen that the fan is not operating, or that the air flow path is blocked or that the display device 10 is locked in the "visible" position; all that would lead to an assumption that there is an absence of a correct flow of air but in the absence also of certainty regarding the effective operation condition of the refrigerator at the time of observation, there is the uncertainty that the presence of the signalling part 12 is due to some internal irregularity under the above-indicated conditions rather than due to the regular break in operation of the refrigerator because it is controlled in that way by the thermostat.

To avoid this last-mentioned uncertainty it is advantageous to adopt a suitable control means and associated circuit arrangement such as to be able to actuate just the fan even when the refrigerator is not operating; in that way, when the signalling part 12 is exposed and thus there is no flow of air, by actuating the control means it is possible to observe if the signalling part 12 disappears; if that happens it means that a regular flow of air has started and that thus the cooling system and associated signalling means are operating properly.

As stated it is important that the fan can generate a flow of air of sufficient constant capacity and that condition is not verified if there are additional air flow paths which are caused for example by virtue of the refrigerator being at a different height from the floor. That fact is particularly harmful both because cooling of the internal components is limited and because even with the existence of a control means for testing operability as just described above, the condition could arise where the flow of air generated is still inadequate to actuate the signalling part, thus thwarting each construction described above.

To avoid that problem it is advantageously proposed that the conventional base is replaced by a complete base in particular in respect of the components which

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define the air intake conduit A and the discharge conduit B; more especially the base does not provide zones which permit air to pass from the exterior of the base to its interior, except of course for the intake and discharge mouth opening, and the two intake and discharge conduits are always kept separate and distinct in such a way as to avoid  
5 turbulence and mixing phenomena.

That result is attained (see Figures 9 and 10) by a base 30 provided with two intake and discharge conduits A and B respectively, the mouth openings of which are disposed at positions corresponding to the lower front grill, and also provided with a lower casing 31 which delimits both said conduits downwardly.

10 In addition the fan 32, the condensor 33 and the compressor 34 are disposed precisely within the path of the flow of air, so that the result obtained is as follows:

a) it is certain that forced into said conduits is an amount of air which is strictly constant and pre-definable independently of the position of the refrigerator; and

15 b) both the condenser and the compressor have all that amount of air passing thereover, without therefore suffering the power losses of a fan which operates partially 'empty' and a condenser which is cooled in an irregular and unforeseeably variable fashion.

In addition a further improvement in the base is achieved if the intake and  
20 discharge mouth openings are separated and spaced by a separation zone 35 and not by a conventional this baffle, in such a fashion as to minimise air remixing caused by the intake on the part of the intake conduit A of part of the air issuing from the discharge conduit B.

The advantage of such improvements is shown by a substantial reduction  
25 in the level of consumption; for example a strictly mass-produced refrigerator manufactured by the same applicants and provided with a base according to the invention, in the course of exhaustive experiments, achieved an energy saving of 20% with respect to a refrigerator which is similar in terms of typology of product and performances but without the present base.

30 Production of the refrigerator is further improved and simplified if the base is assembled to the other load-bearing elements before the foaming operation in such

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a way that the upper surface of the base becomes the surface for external containment of the layer of insulating material which is injected below the preservation space.

That construction affords the additional advantage of improved robustness of the structure of the refrigerator since the actual structure of the base becomes an  
5 integral part of the structure of the refrigerator.

With particular reference to Figures 9, 12, 13 and 14, a final improvement of the illustrated base will now be shown: that improvement lies in the provision, integrally therewith, of a plurality of engagement elements 40, 41 in respect of the compressor, 42 in respect of the fan, 43 in respect of the assembly of the condenser, 44  
10 in respect of the lower casing and 45 in respect of the front grill, which have the characteristic of being shaped with portions of undercut configuration, like the element 40, or with suitable sliding guides 44 or with latching engagement portions, which already permit complete positioning and fixing of the respective components by means only of a displacement into the recess or the definitive position in which they are to be  
15 accommodated; final fixing of such components is effected by the use of normal locking means which are known in the art.

That improvement affords the advantage that assembly and initial locking of the components takes place absolutely immediately without practically any possibility of error and much more quickly than with the conventional methods.

20 Although the invention has been described with reference to the example of the preferred embodiments and using known technology, it is not deemed limited thereby since the man skilled in the art may make many variations therein.

It will be appreciated therefor that the accompanying claims comprise such obvious modifications which are apparent to the man skilled in the art and which are  
25 within the scope of the present invention.

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## CLAIMS

1. A refrigerating appliance, of the type to be built in or fitted under a  
worktop, comprising at least one space for preserving foods, a subjacent base in which  
5 are accommodated a condenser, a fan and a compressor, said base being provided with a  
plurality of front grills with respective openings for the intake and discharge of the air  
for cooling said components of the refrigerating unit, said base comprising two distinct  
and separate passages on the intake of the cooling air from the exterior and for the  
discharge of the cooling air to the exterior, the section of said passages being completely  
10 independent of the position (height) at which said refrigerator is accommodated, wherein  
the openings for access to said two passages are spaced by a separation zone.
2. A refrigerating appliance according to claim 1, wherein said base  
comprises a lower casing which delimits the lower side of both said passages, said casing  
15 being slidably and horizontally removable in suitable guides provided in said base..
3. A refrigerating appliance according to claim 1 or 2, wherein said base  
integrally comprises a plurality of engagement elements related to the compressor, the  
fan, the assembly of the condenser and the front grill which have the characteristic of  
20 being shaped with portions of undercut configuration or with latching engagement  
portions which are capable of defining the accommodation for the respective  
components.
4. A refrigerating appliance according to any one of claims 1 to 3, wherein  
25 said base delimits in its lower part the structure of the insulating mass and that it is  
associated in monobloc with the insulating structural elements of the refrigerator.





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Application No: GB 9920567.6  
Claims searched: All

Examiner: M C Monk  
Date of search: 5 October 1999

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): F4H

Int Cl (Ed.6): F25D (17/08, 23/00, 23/06)

Other: ONLINE DATABASES: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0568809 A1 LIEBHERR-HAUSGERATE GMBH See EPODOC and WPI abstracts. Spaced openings (5,6).	1
X	EP 0383221 A2 MERLONI ELETTRODOMESTICI SPA Inlet and outlet air flows spaced by a U-shaped base member (3).	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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